What would it take to convince you?

Bayesian updating using posteriors from a meta-analysis of published literature as priors for a Registered Replication Report

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Bayesian analysis – the updating of beliefs in light of data – has received increased attention in recent years. However, researchers are divided about whether the integration of individual beliefs into analytic models represents a net strength or weakness of the Bayesian approach. Frequently, even Bayes-curious researchers can struggle with the question of how to select priors. This article presents Registered Replication Reports as a good candidate for the easy selection of priors for Bayesian updating of beliefs.

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Recently, Moran et al. conducted a RRR of Olson and Fazio’s ‘surveillance task effect’. This effect claims to test the ‘unaware evaluative conditioning’ hypothesis.

While Moran et al employed a frequentist approach in their analyses, it is notable that they presented the results of a meta-analysis of the surveillance task effect literature in their introduction justifying the RRR. As such, Moran et al provide information about both a) prior beliefs in the extant literature and b) new data from a large multisite study (whose protocol had been approved by the original authors).

The data Moran extracted from the published literature was refit using a Bayesian meta-analysis model using weak priors (XXX). The posterior distributions of this model were then used to create a set of priors for the meta analysis of the RRR data. This prior is referred to as the “Well-estimated true effect” prior, and represents a belief in both a) the presence of a true effect (of mean delta = 0.20) and relative confidence around the effect size of that true effect (SD of delta = XX).

Three other sets of priors were also created that represent prior belief in 1) a “Poorly-estimated true effect”, 2) a “Well-estimated null effect”, and 3) a “Poorly-estimated null effect”. The last of these priors is closest to what is often described as a weak prior. Relative to the “Well-estimated true effect” prior, each of these three manipulated the presence of the true effect (mean delta = 0.00 vs 0.20) and the degree of certainty around the effect size (sd delta = XX vs XX). See Figure 1.

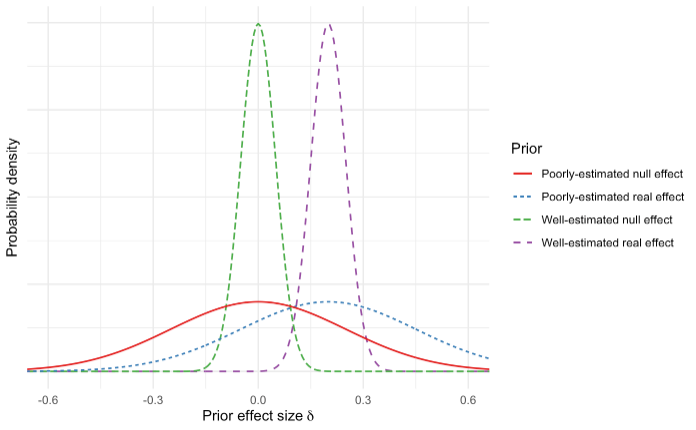


Figure 1. Density curves for the four prior probabilities.

XXX

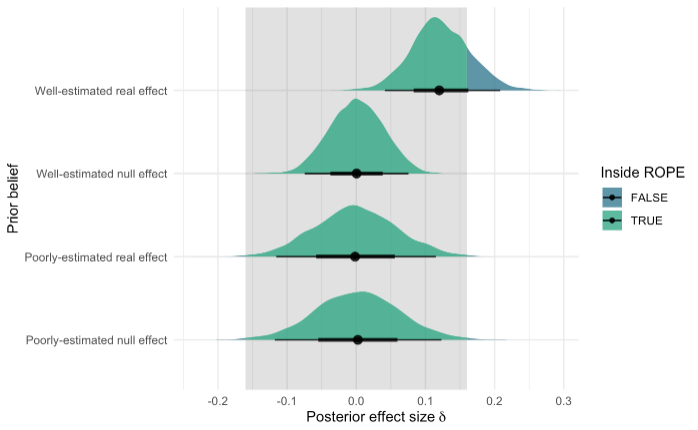


Figure 2. Posterior beliefs as a function of each prior and the data.

Results demonstrate that a posterior belief in the presence of a true effect given the data was contingent on both a) a prior belief that the effect was real but also b) relative certainty about the magnitude of the effect size.

# Notes

## Author contributions

IH conceptualized the study and analyzed the data. SH provided critical input into the design and analysis. Both authors wrote the article and approved the final submitted version of the manuscript.

## Declaration of Conflicting Interests

IH and SH declare we have no conflicts of interest with respect to the research, authorship, and/or publication of this article.

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